a repair mechanism. Upon failure, the system is replaced by a new and identical one. The system can be also replaced before failure at a certain cost rate. We determine the optimal replacement time that minimizes the long-run average cost per unit time.

A Note on the Conditioning of the Survival Probability on Random Information

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Failure intensities in which the evaluation of hazard is based on the observation of an auxiliary random process have become increasingly popular in survival modeling. While their definition in the counting process and martingale framework is well known, their relationship to conditional survival functions does not seem to be equally well understood. This paper gives a set of necessary and sufficient conditions for the so called exponential formula in this context.

The Stochastic Performance of Continuum Structure Functions

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A *continuum structure function* (CSF) is a nondecreasing mapping $\gamma:[0,1]^n \to [0,1]$. Such functions are of interest in reliability theory where x_i denotes the state of component i ($i = 1, 2, \ldots, n$) and $\gamma(\boldsymbol{x})$ denotes the state of the system composed of components $\{1, 2, \ldots, n\}$: see Baxter, J. Appl. Prob. (1984) 802–815, Baxter, Math. Proc. Camb. Phil. Soc. (1986) 331–338 for details.

Define

$$P_\alpha = \{\boldsymbol{x} \mid \gamma(\boldsymbol{x}) \geq \alpha \text{ whereas } \gamma(\boldsymbol{y}) < \alpha \text{ for all } \boldsymbol{y} < \boldsymbol{x}\}, \quad 0 < \alpha \leq 1,$$

the set of *minimal vectors* to level α. Block and Savits, Operat. Res. (1984) 703–714 show that any right-continuous CSF is characterized by its minimal vector sets.

Suppose, now, that $X_1, \ldots, X_n$, the states of the components, are independent random variables. In general, the distribution of $\gamma(\boldsymbol{X})$ is hard to calculate. However, if each P_α is finite, the distribution is easily evaluated. Further, if γ is an arbitrary right-continuous CSF, the distribution of $\gamma(\boldsymbol{X})$ can be approximated arbitrarily closely by that of $\gamma'(\boldsymbol{X})$ where γ' is a CSF for which each P_α is finite. If the distribution function of $\gamma(\boldsymbol{X})$ is continuous, the convergence is uniform.

Suppose, now that the states of the components comprise a stochastic process $\{\boldsymbol{X}(t), t \geq 0\}$ such that $\boldsymbol{X}(t) \xrightarrow{\mathrm{D}} \boldsymbol{X}$ as $t \to \infty$. Further, the system is assumed to change in time, the CSF at time t being denoted γ_t. If $\gamma_t \to \gamma$ either (i) pointwise or (ii) in a quasi-Skorohod topology, then $\gamma_t(\boldsymbol{X}(t)) \xrightarrow{\mathrm{D}} \gamma(\boldsymbol{X})$ as $t \to \infty$.